An Analysis of the Non-verbal Social Behavior of a Child in a Kindergarten Setting

By

Jerome R. Freund

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To Elizabeth, Robbie and Natashya
whose love and patience created the conditions
for completion of this manuscript.

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Jerome R. Freund

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A descriptive and experimental study was made of the ways in which one kindergarten child touched his classmates and was touched by them. The descriptive portion of the study attempted to determine whether the touching responses demonstrated a structure both within and across sets of responses. The experimental portion of the study attempted to determine what stability the social system would demonstrate when an experimental intervention was introduced.

The social system of physical contact was studied by using a multiple baseline operant paradigm. Response rates of ten variables for the target child's responses and his classmates' responses respectively were collected during the baseline phase. During the phase of experimental manipulation one of the target child's response rates was increased via the use of a form of token economy. Multiple baselines were collected during this

phase as well as during the final phase, the return to baseline. During this last phase no experimental manipulations were in force.

Two statistical methods were used in the data analysis, factor analysis and correlational analysis. Factor structures were found within each set of responses. Forty significant correlations were found when comparing across phases the respective rates of the two sets of responses. Stability was found across phases in terms of the factor structure, the variable composition of factors and the cross-correlation of response variables.

It was concluded that the social system of physical contact studied in the kindergarten setting exhibited a definite structure, both within and across sets of responses. This structure demonstrated three types of self-regulating mechanisms when the system was experimentally disturbed. Additionally it was observed that the behavior repertoires of the target child and his classmates successively approximated each other across phases. The data suggested that the phase of experimental manipulation stimulated this mutual approximation.

An Analysis of the Non-verbal Social Behavior of a Child in a Kindergarten Setting

Literature Review and Statement of Problem

The purpose of the present study was to describe the structure and some of the relationships of the social world of a kindergarten child and to demonstrate a new combination of methods for doing so. In this study an effort was made to define precisely and measure a certain set of social behaviors in order to describe one aspect of the complexities of a child's social interactions. The aspect studied was the various ways in which one child touched and was touched by his classmates. It was hoped that: (a) a factor structure could be found within each set of responses; (b) response classes or clusters of variables would be found within each factor; (c) that evidences of system homeostasis would be found after the social system was experimentally disturbed; and (d) evidences of the successive approximation of each set of responses to the other might be found, i.e., that an increasing number of stable interaction patterns might occur across time. This approach, though utilizing operant technology, follows in the tradition of developmental studies made nearly forty years ago (Arrington, 1932; Murphy, 1937). Arrington looked at a variety of classroom behaviors in two-year-old children in an attempt to determine some developmental norms. Murphy

also looked at a variety of discrete behaviors performed by young children in order to relate personality factors to behavior. Though verbal behavior was noted in these studies, its content did not receive particular attention.

Contribution of Social Psychology

Since Moreno's invention of sociometry (Moreno, 1956) the literature of social psychology has been replete with studies analyzing social interactions in natural, laboratory, and "game" settings (Bales, 1950; Bavelas, 1950; Beauchamp, 1970; Bormann, 1969; Carson, 1969; Collins and Guetzkow, 1964; Deutsch, 1953; Gamson, 1964; Isaacs, 1965; Kaufmann, 1967; Luce and Raiffa, 1957; Shaw, 1971). In addition to describing the formal characteristics of groups, much work has been done in an effort to describe the feelings and attitudes generated in social interactions (Abrahamson, 1966; Bales, 1969; Carkhuff and Berenson, 1967; Rogers, 1970) and how these are related to the more formal group characteristics (Bormann, 1969; Liberman , 1970).

A real difficulty with both the formal and feeling-level approaches to social interaction analysis is that the actual behavior of people in groups is not measured. Rather a "sign" (Weiss, 1968), or other behavior suppos-

edly representing the behavior of interest, is utilized. Thus with respect to rating scales, choice patterns, etc., the reader is not at all assured that the choices and attitudes reported by group members actually obtain during the ongoing social interactions. As Skinner (1969) notes, behavior used to describe or predict other behavior is an uncontrollable variable. In the types of analyses done by Bales (1950, 1969), Rogers (1970), Liberman (1970), Mishler and Waxler (1968) and others of this genre, a great deal of precision is sacrificed in order to gain comprehensiveness. The problem remains of determining whether the behavior measured really does represent the attitude or feeling it is said to represent. A great deal of scoring is left to the judgement of the raters. Thus it is possible that the results of such studies measure in fact a good deal of the raters' attitudes (Rosenthal, 1966).

Social Environment: The Operant Approach

Social psychologists have in general confined their group studies to groups of adolescents and adults (Hare, 1962; Bradford, Gibb and Benne, 1964). Very little effort has been expended in the analysis of the social interactions and transactions of young children. It is with the experimental analysis of behavior that studies of this sort as well as theory building may be found

(Azrin and Lindsley, 1956; Baer and Wolf, 1966, 1970; Cohen, 1962; Homme, 1970; Homme, C'deBaca, Cottingham and Homme, 1968; Lovitt, Hunzelmann, Nolen and Hulten, 1968; Neisworth, Deno and Jenkins, 1969; Patterson, 1966; Patterson and Anderson, 1964; Patterson and Gullion, 1968; Patterson and Reid, 1970; Staats and Staats, 1963). The approach represented by these researchers continues the tradition of direct recording of behaviors of interest, noted in the early studies of Arrington and Murphy. It adds to this approach the precision and objectivity of a well-developed operant technology.

The operant approach to the analysis of behavior seems to be well adapted to expand its efforts from the investigation of organisms singly to their investigation in groups. One of the foundations of this approach assumes the functional relationship between the organism and its environment. This is stated frequently as the relationships which obtain among the antecedent events, the response itself and the consequences to the responding organism of its response (Skinner, 1969). This formulation is sufficiently broad to include social stimuli and responses (Lindsley, 1963). Thus social events may be considered as eliciting, reinforcing, discriminative, facilitative or suppressive stimuli; responses may be social and schedules of reinforcement may be programmed

by the social milieu of an organism rather than by automatic equipment (Lindsley, 1963). Whereas in the classical "Skinner-box" operant work stimulation was one way, i.e., towards the responding organism, research may meaningfully investigate two-way or n-way stimulation in the analysis of social interactions (Lindsley, 1963). In the social setting, behavior becomes interdependent (Patterson,1966; Weingarten and Mechner, 1966). This interdependence becomes a new independent variable (Burgess and Bushell, 1967) in the study of behavior. Patterson (1966) notes that interdependence is that condition where the social milieu exerts pressure for behavior change in specified directions. Individual behavior which is "valued" by the group, i.e., which is rewarding to it, is awarded positively reinforcing consequences. Behavior which is not desired by the group is not reinforced. Thus, the behavior of individual members of a group is shaped to some set of group "norms" (Burgess and Bushell, 1967; Patterson and Anderson, 1964; Thibaut and Kelly, 1959; Watzlawick, Beavin and Jackson, 1967).

Interdependence becomes a patterned interaction or patterned set of social relationships, which is a social system (Burgess and Bushell, 1967). A social structure is the specific form these inter-

actions assume (Burgess and Bushell, 1967). One of the major thrusts of the present study was to discover the nature and form of the pattern of social relationships occurring in a kindergarten classroom.

Interdependence gives rise to a corollary variable, i.e., homeostasis (Burgess and Bushell, 1967). This is the way a social system adapts to change in its environment by the acceleration or deceleration of certain interaction patterns which limit change in other of its patterns. During the system's adaptation to new circumstances it is in a state of disequilibrium. Having attained a new level of adaptation the interaction patterns stabilize and reach equilibrium.

There are three essential features of a social situation (Sidowski, 1957):

1. two or more subjects' responses produce rewards or punishments for each other;
2. the principal source of reward or punishment for any subject is the response made by the other subject;
3. the responses controlling reward and/or punishment are subject to learning.

The dyad or two-person group is the smallest social grouping which exhibits these features and is the

simplest with which to begin a functional analysis of social interaction. Many investigators have adopted the tactic of studying dyadic interaction (Carson, 1969; Hastorf, 1966; Homans, 1961; Lindsley, 1963; Patterson and Reid, 1970; Sidowski, 1957; Thibaut and Kelly, 1959). The present study focused upon the dyad as the primary social unit of study. It also assumed as axiomatic the view that social interaction is the emission of behavior by two individuals in each other's presence (Thibaut and Kelly, 1959), whose behavior may function as discriminative stimuli, social responses or reinforcers for participants (Watzlawick, Beavin and Jackson, 1967).

Summary of Literature Review

The preceding sections have presented an overview of current concepts in the study of human social interaction. Early work examining the behavior of children in groups directly examined the behavior of interest. From this, inferences were drawn concerning child development and personality traits. Later work in the study of groups turned to more indirect analysis in order to build inferences with reference to formal group structuring, communication patterns, leadership emergence, cohesiveness, affections, etc. Methodological problems with respect to validity, reliability and experimenter

contamination of effects became important. A further problem was the relative neglect of the study of group behavior of young children. It was found that very good, precise work with children's groups has been done by those who espouse the experimental analysis of behavior. This suggested a return to the direct investigation of group behaviors ranging from groups of young children to adults. Though experimenter effects are still a problem to contend with, this approach greatly reduces problems of validity and reliability as compared to previous approaches.

Strategy of the Study

Despite the increasing interest in human interactions in operant research, a survey of the literature seemed to demonstrate a paucity of work in describing the whole complex of interrelationships of individuals, especially children, in a social setting. The basic thrust of the present work was to study an entire small social system in order to measure and describe as accurately as possible its nature. Descriptive research (Bijou, Peterson and Ault, 1969; Selltiz, Jahoda, Deutsch and Cook, 1959) attempts to accurately portray the characteristics of an individual, group or situation by determining the frequency of occurrence of the events of interest or the frequency of association of events

with other events. This type of research is frequently employed in the field.

Another type of study employed in both lab and field is the experimental study (Bijou, Peterson and Ault, 1969; Kerlinger, 1964) which describes the functional relationships between events. The present study employed the ideas of both descriptive and experimental research. Phase I was limited to the description of the relationships which were already existent in the social system studied. Phases II and III were experimental in that Phase II involved the manipulation of one variable of interest while monitoring the others and Phase III removed the experimental manipulation of Phase II. The assumption was that change in one part of the response system would result in corresponding changes in other parts of the system functionally related to the part manipulated. Experimental manipulation then was the test of the nature and strength of the functional relationships of the variables of interest. Another way to conceptualize the study was in the form of the single subject, A-B-A design familiar in operant work (Baer, Wolf and Risley, 1968).

Research Tactics

A major procedural question concerned how actually to study the tremendous complexity of n-way interactions occurring rapidly in a viable social system. It seemed clear that any social interaction is really the existence of several dyadic interactions concurrently, the memberships of which are continually changing. If "public appearances," such as speeches, panel discussions, etc., are eliminated, the routine face-to-face interactions in which persons engage mainly involve dyadic interactions. These interactions may be long- or short-lived and any one person may have many or few persons with whom he interacts. In view of considerations such as these, one of the major assumptions of the research was that the interactions of a group could be broken down into dyadic relationships.

When the social group contains twenty-one persons, as it did in the present study, two hundred and ten possible combinations of dyads may occur. This raised the next issue, the matter of whom to observe. A second assumption of the study was that "n" persons in a group do not constitute one social entity in any real sense, but that they constitute "n" social entities interlocked in various ways. With a class of twenty-one persons there would therefore be twenty-one different social worlds, each having a different person as its center and each interlocking in slightly different ways with the

others (Proshansky, Ittelson and Rivlin, 1970). The present study limits itself to the description of the single individual's social relationships within the specific context of the classroom.

The next issue involved the behaviors themselves. Varieties of touching behavior were chosen because they were easily observable and because they formed a part of each child's repertoire of social responses to other children.

The next major issue concerned the research strategy. An assumption was that if a relationship was found between an aspect of the target child's behavior and the behavior of those he touched, then this relationship would show some stability if the system was experimentally changed. Another possibility was that if the relationships were disrupted during an experimental change, then the relationships would reappear once the experimental manipulation was removed. It was felt that the A-B-A pattern, or baseline-consequation-return to baseline pattern, was the strategy of choice for testing these assumptions.

In order to further elucidate functional relationships, the method of multiple baselines (Bijou,

Peterson and Ault, 1969; Baer, Wolf and Risley, 1968; Sidman, 1960) was employed. The assumption was that the kinds of touching behavior within each child were not independent of each other but could be regrouped into larger response classes. Keeping multiple baselines would demonstrate whether this assumption were true or not. Since response classes were assumed rather than known, factor analysis was the statistical method of choice with which to analyze the data (Burt, 1966; Hoon, 1970). The keeping of multiple baselines throughout all phases made such an analysis possible. An additional assumption was that either the factor structure of responses would remain stable across the three phases of the study or that, if the consequation phase disrupted the structure, the baseline structure would reappear during the return to baseline. A third possibility was that if a new factor structure appeared during consequation it would endure throughout the return to baseline. The implied assumption is that the social system studied would have self-regulatory mechanisms stabilizing the system despite interference. The A-B-A plan of attack coupled with multiple baseline recording was believed to be adequate for the description of homeostasis in the system, if it appeared.

Summary of Research Strategy

The concept of the study, in summary, was a description of one child's social environment in a kindergarten classroom. The purpose of this work was: (a) to discover the formal pattern of responses within each set of responses; (b) to discover response classes stable over at least two phases of the study; (c) to discover stable relationships in the interaction patterns of the target child and his peers; and (d) to discover the nature of the homeostatic mechanisms operative within the social system studied. The specific social behaviors studied were the various kinds of touching behaviors made by and to this child to and from other children.

Selection of Behavior

Before commencement of the study proper, a series of extended observations were made in a kindergarten class of Sidney Lanier Elementary School. A preliminary list of categories of touching was drawn up based upon these observations. The original list contained sixteen separate categories of touching. During the baseline phase of the present study, four categories were dropped because there were no instances of behavior to fit into these categories. Two more categories were omitted during the data analysis. No categories were added after the start of the study.

The ten final categories with their respective final code numbers were: (1) "Brush off"; (2) "Hit"; (3) "Push"; (4) "Grab"; (5) "Grasp"; (6) "Pat"; (7) "Hand Hold"; (8) "Hug"; (9) "Arm Around Body"; and (10) "Touch." Definitions of each category may be found in Appendix A.

Ideas for the categories were obtained from prolonged acquaintance with kindergarten behaviors and an anticipatory analysis (Selltiz, Jahoda, Deutsch and Cook, 1959) of all possible types of touching responses.

Further, it was attempted to make the category list exhaustive and mutually exclusive (Selltiz, Jahoda, Deutsch and Cook, 1959; Kerlinger, 1964) so that all possible touching behaviors of interest could be recorded unambiguously.

Selection of Research Site

The research was carried out in a kindergarten classroom of Prairie View Elementary School in Gainesville, Florida. This proved to be a good choice because the room design facilitated data collection, the classroom teacher was cooperative, and the children were experimentally naive.

Children were chosen as subjects because of the paucity of research in the social dynamics of children's groups.

The decision was made to examine a children's group from the point of view of a single child. Two criteria were employed in the selection of such a target child.

1. The child's rate of touching had to be sufficiently high for the collection of adequate rates.
2. The child's touching repertoire had to be suffi-

ciently varied so that the number of recorded baselines in the multiple baseline procedure could be maximized.

David W. was the child chosen for study.

Recording Method

The decision was made to continuously record the behaviors of interest. This event sampling technique (Kerlinger, 1964) was chosen because it was believed that a continuous record was necessary in order to discover what relations existed in the target child's social world. This method also facilitated the computation of behavior rates, the raw data of operant research (Honig, 1966). The observation period was about 100 minutes in length during the baseline phase, and reduced to 60 minutes during the following two phases. Thus the study concerned itself with the analysis of a child's social system during periods of free play.

Data were gathered along three dimensions:

1. who David touched and who touched David;
2. what type of touching behavior was exchanged;
3. who initiated the interchange and whether there was a response.

Analysis of the third dimension was excluded from the

study because of difficulty in precisely recording the "initiation" and "response" categories.

Data were recorded upon a single sheet composed of a series of two-by-two tables. Columns were labeled "Initiation" and "Response" respectively while rows were labeled "David" and one of the other children's names respectively. Since there were about twenty other children in the room with David, there was the possibility of having twenty separate two-by-two tables, one for each of the possible dyads in which David participated. Cell entries were composed of the number codes of each of the touching categories. A fresh sheet was used for each new day of observation. Data were taken for about three days per week. Total observation days for baseline, consequation and return-to-baseline phases were 20, 21 and 21 respectively. Standard procedure for the typical operant paradigm suggests (Sidman, 1960) that rates should attain stability before a phase change is introduced. Since it was not known in advance whether touching rates in the interaction situation would attain rigorous stability, it was decided to arbitrarily divide the observation times into three roughly equivalent segments. This was done to insure the completion of the three-phase study before the termination of the school year. A sample two-by-two table is included.

For purposes of illustration, this would represent the data collection format for the David-Allan dyad of day "n."

	Initiation	Response
David	category codes	category codes
Allan	category codes	category codes

Data were taken by an observer sitting in the classroom during the entire observation period. In order to minimize the effect upon classroom behavior of an additional adult in the room, it was decided that the observer should remain the same throughout the study. The assumption that habituation to his presence would take place was substantiated in the study. These data will be presented in the discussion of experimenter effects. With the exception of the reliability checks, only one observer was used throughout the entire study, namely the experimenter himself.

Baseline

During the baseline phase, rates of occurrence of the ten types of touching behavior were collected on each dyad of which David was a member. The observer entered the room at the commencement of the school day and took a seat at the rear of the room. No interchange

was allowed between observer and children during the observation period proper. David was kept totally unaware of the fact that he was the target child during this phase. From the observer's position, almost all of the activity of the room could be kept under surveillance.

Consequation

Two issues were involved in the planning of the consequation phase: (1) what behavior to consequate; and (2) the method of consequation itself.

One of the purposes of the study was the attempt to uncover factors or response classes. Insofar as behaviors belonging to any one response class are highly correlated with each other, the increase in any one of them would produce an increase in the rates of the other response class members. If this were to be demonstrated, the possibility of spurious correlations among behaviors would be reduced. Consequently, it was believed that the behavior to be consequated should be one highly correlated to a response class. Therefore the baseline data of the behavior where David was touching others were factor analyzed and rotated to the Varimax criterion (Guertin and Bailey, 1970) in order to discover in some preliminary way what the factor structure might be. Variable

number seven, subsequently renumbered to five, the "grasp" variable, was chosen for consequation. Appendix B presents the factor matrix and rationale for selection of this variable.

Two methods of reinforcement delivery were considered, i.e., schedules of intermittent reinforcement and a system of secondary reinforcement along the lines of a token economy (Ayllon and Azrin, 1968; Birnbrauer, Wolf, Kidder and Tague, 1965; Clark, Lachowicz and Wolf, 1968; Wolf, Giles and Hall, 1968). The second approach was adopted because it would keep the danger of satiation to a minimum, would be a stable source of reinforcing consequences over prolonged periods of time and would intrude as little as possible upon the ongoing social interactions of David and his classmates.

The consequation phase was preceded by approximately one month of training for David. The reinforcement schedule itself was a rather complex chain of events which proceeded as follows:

1. When a "grasp" occurred it was immediately followed by the sound of a muted bell.
2. A token was placed in a bowl by the observer immediately after the bell sounded.

3. Approximately one second of time out followed the placement of the token in the bowl while the rewarded response was noted on the data collection sheet.
4. This sequence of steps 1-3 above was repeated five times.
5. Upon the fifth repetition, a buzzer was sounded immediately after the token was placed in the bowl.
6. At the sound of the buzzer, David came over to the bowl while the fifth response was noted upon the data collection sheet.
7. David exchanged his five tokens for either one of several varieties of food or for pennies. The exchange ratio for food was 1:1, while the ratio of tokens to pennies was 5:1. Food had to be eaten on the spot and pennies had to be pocketed.
8. A ten-second limited hold was in effect after the sound of the buzzer. Uncollected tokens were removed thereafter.
9. At this point the whole schedule started over again.

As with all response-chain building, the chain was shaped in reverse (Ferster and Perrott, 1968). The various stages in the building of this chain may be found in Appendix C.

Return to Baseline

The return-to-baseline phase was begun immediately after 21 days of consequation had been recorded. All reinforcement of behavior was abandoned and all the paraphernalia associated with the consequation phase was removed. The observer limited himself to recording the ten touching variables in the manner done during the baseline phase. After 21 days of observation, the study was brought to a close.

Methods of Data Analysis

The study addressed itself to: (a) the investigation of the interrelationships among the persons of a small social system; and (b) the effect upon the structure of these relationships when the system is experimentally disturbed. Two statistical tools were used in the attempt to answer these questions: factor analysis and cross-correlational analysis.

The factor study attempted to determine the existence of response classes intrinsic to the target child's behavioral output and also to the behavior he received at the hands of his classmates. The correlational study attempted to describe the relationships which existed between the behavior exhibited and the behavior received by the target child.

Factor analysis is robust with respect to assumptions concerning normalcy of score distributions. Factor analysis makes no assumptions about normality (Cattell, 1966b) though the resulting simple structure is clearer if scores are normally distributed. Also, if non-linearity is a possibility in the data, the usual factor analytic procedures produce very good first approximations to simple structure (Cattell, 1966b; Digman, 1966).

Two types of data were factor analyzed. One type was labeled "David" while the other was labeled "Class." The "David" data were in three parts, corresponding to the three phases of the experimental study, as were the "Class" data. Both "David" and "Class" data were represented by a three-dimensional matrix in which behavior variables were columns, observation days were rows and phases of the study were the depth. Cell entries of the "David" and "Class" data represented the daily rates at which the target child emitted and received respectively the behavior of interest.

Each phase was factored separately for both "David" and "Class" data types. The correlation matrices employed behavior variables as "relatives" and observation days as "referees" (Cattell, 1966a). Matrix

entries were unimodal (Cattell, 1966a) throughout. The associated factor analytic technique was the P-technique (Cattell, 1966a). The factor loadings represented the correlations of variables with the dimensions upon which a single "individual" varied (Kelly and Lingoes, 1962). Cattell (1966c) denoted these dimensions as "state dimensions," unique to the individual. For purposes of the study, the resulting dimensions were the unique response classes of behavior emission and reception vis-á-vis the target child.

Of various definitions of factors set forth by Cattell (1966b), the one most closely related to the concerns of this study considers a factor as an emergent ongoing process generating a set of relationships to variables. Thus the response classes sought were conceived of not as static entities but as relatively identifiable processes accounting for the covariance of groupings of behavior variables.

The objectives of the study were to demonstrate that response classes, i.e., a factor structure, could be found. What happened to the resulting structures during the manipulation phase and the return to baseline was the focus of interest. No hypotheses were made concerning how the structures would change, except that

some structure would be apparent in Phases II and III . . It was the expectation that the factor structure of Phase III , would bear a good deal of resemblance to the structures of either Phases I , or II rather than being , a new structure. This expectation then either looked for evidence of reversibility during the return to baseline or looked for the maintenance of the altered level of functioning produced by the consequation or second phase.

The decision was made to use both orthogonal and oblique solutions in an effort to find the simplest structure. Cattell (1966b) argues for oblique rotations asserting that factors usually tend to be correlated to some degree in samples. Secondly, the use of oblique rotations permits higher-order factor solutions or the construction of factor hierarchies (Schmid and Leiman, 1957). Since it was not known in advance whether the present study would or would not need to utilize higher-order factor analyses to achieve its goals, oblique rotations were employed along with the more conventional orthogonal rotations.

Experimenter Effects

Recently an increasing amount of attention has been given to the ways in which researchers influence the course of their investigations (Bandura and Walters, 1963; Byrne, 1969; Rosenthal, 1966; Sarason, 1966). One of the consequences of this phenomenon is the non-replicability of experimental results across experimenters (Sarason, 1966). By and large, interest has concerned the effects of experimenter expectancies particularly in social interaction situations (Sarason, 1966; Rosenthal, 1966). One solution which has been proposed (Rosenthal, 1966; Sarason, 1966) involves the removal of the experimenter from the situation and his replacement by completely automated equipment. In many studies, including the present one, this procedure was not economically possible. An alternative (Rosenthal, 1966) involves strict curtailment of any information carrying cues from experimenter to subjects. This was the procedure adopted in the present study. At no time during the study proper were the children, David or the class teacher, informed of the true nature of the investigation.

Since the study involved the investigation of social

interactions in a free responding situation, it was important to gain some measure of the constraints put upon the social system by the mere presence of the observer. The assumption was made that the amount of attention received by the observer from the children was a function of the disturbance his presence caused in the classroom. The attending behavior considered relevant and recordable was "looking at the observer."

A "look" was recorded whenever the gaze of a child paused for a moment or longer upon the person of the observer. Data were collected concurrently with the collection of the baseline data and later during the return to baseline. It was estimated that most of the attending behavior was recorded. Data were recorded over nine weeks. A table of results follows.

Table 1
Daily Rates of "Attending" Behavior
Class Rates

Week	Days				
	Mon	Wed	Fri	Sum	Mean
1	.47[a]	.37	.35	1.19	.396
2	.14	.41		.55	.275
3	.32	.26	.28	.86	.286
4	.20	.20	.21	.61	.203
5	.10	.17		.27	.135
6					
7	.16	.12	.24	.52	.173
8	.12	.14	.15	.41	.136
9	.07	.14		.21	.105
Sum	1.58	1.81	1.23	4.82	
Mean	.197	.226	.246		.223

[a]rates are movements per minute

The regression coefficient was found for the above data. This coefficient was used in a regression equation to locate the two endpoints of a line which best fit the data points. Linearity of data was assumed. This computed line was plotted upon six-cycle logarithmic paper. The average deceleration of the line was found to be 0.83 movements per minute per week. Assuming that an acceleration of 1.00 movements per minute per week indicates no change, the 0.83 index signified a moderate but definite downward trend in the data.

It was assumed that the attraction of the children toward the observer was a function of the relative number of rewards and/or punishments associated with him (Byrne, 1969). Consequently the observer rigorously avoided any vocal or non-vocal cue which might acknowledge his awareness of the children's presence. In order to test this assumption, a brief experiment was conducted during the return-to-baseline of the major study. There were five parts to this experiment:

1. collection of a short baseline;
2. following all children's "looks" with a smile from the observer;

3. an extinction phase;
4. following all childrens' "looks" by both a smile and a greeting from the observer;
5. an extinction phase.

The data are summarized in the following table.

Table 2
Summary of the Reinforcement of "Attending" Behavior
Table of Daily Rates

Phases	Days						
	Mon	Tue	Wed	Thu	Sum	Mean	MS
Baseline		.54	.38				
		.70	.39	.30	2.31	.462	.0252
Cons. I	1.20	.90	.78	.90	3.78	.945	.0321
Extinc.	.30	.30	.25		.85	.283	.0008
Cons. II		1.30	.90	1.00	3.20	1.066	.0450
Extinc.	.16	.28	.50	.12	1.06	.265	.0294

A Newman-Keuls means comparison test (Kirk, 1969) was run comparing the baseline and two extinction means with the two consequation means. The following table summarizes the results.

Table 3
Reinforcement of "Attending" Behavior
Comparison of Means Differences

Phase	Phase	
	Cons. I	Cons. II
Baseline	.60*	.80*
Ext. I	.66*	.78*
Ext. II	.46*	.60*

*p < .01

The results suggested that "attending" behavior increases were a function of the social reinforcements dispensed by the observer.

Reliability

A useful procedure is one suggested by Arrington (1932), Bijou, Peterson and Ault (1969). In this procedure the reliability is the percentage of agreement of two or more judges with respect to whether the behavior or behaviors did in fact occur.

In the present study the reliability measurement procedure was as follows. Following the suggestion of Bijou, Peterson and Ault (1969), one behavior was scored at a time by two observers. One observer scored only the target behavior selected for that day. The other observer scored his multiple baselines as he had always done.

Behavior was recorded in consecutive five-minute segments. Each instance of the target behavior was recorded on the record sheet with a tally mark. Only those behaviors which seemed to occur most frequently were utilized in the reliability checks. The assumption was that if a high degree of reliability were apparent with them, this reliability would be generally applicable across all ten recorded behaviors. In all, five checks were made, including four of the ten variables. These

four were: (a)"grasp"; (b)"hit"; (c)"push"; and (d)"touch". The indices in the following table represent the number of time segments in which the frequency counts of both observers matched, divided by the total number of time segments.

Table 4
Agreement Percentages of Two Observers

	Behavior				
	Rasp	Grasp	Hit	Push	Touch
Pct.	67	81	100	87	88
SD[a]	4.7	3.9	0	3.4	3.2

[a]Guilford (1965)

The increase from 67% to 81% agreement in the check of the "grasp" variable represented a practice effect. The data suggested that both observers saw essentially the same scorable behaviors. It also suggested that the main observer was able to maintain a relatively high degree of accuracy.

Formal Factor Structure

Each phase of the "David" and "Class" data was factored separately according to a procedure outlined and programmed by Guertin and Bailey (1970). The IBM 360 computer operated by the University of Florida was utilized for the actual computations. Orthogonal factor

solutions, using the Varimax criterion, for "David" and "Class" baseline data follow.

Table 5
Orthogonal Factor Solution
"David" Baseline

Var.	Factor			
	1	2	3	4
5	.70[a]			.38
10	.65			
3	.62	.40		
8		.59		
7		.51	.61	
4		.47		.37
6			.87	
9			.85	
1				.68
2	.43			.50

[a]rounded off from four places

If the squared correlation of variable with factor is taken as a rough estimate of the percent of variance accounted for by the factor, a correlation of 0.30 would account for about 9% of the variance. For purposes of analysis, correlations or factor loadings above this level were used in determining factor composition and listed in Table 5 and all succeeding factor tables. This cut-off level was chosen for analysis of the orthogonal matrices so that factor composition was determined in the same way as that for the oblique factors. With the latter, the

programmed cut-off point was at the absolute 0.30 level of loading. Factor loadings in all tables are rounded to the second decimal place.

Table 6
Orthogonal Factor Solution
"Class" Baseline

Var.	Factor			
	1	2	3	4
2	.81			
5	.80	.35		
4	.50			-.37
3		.72		
10		.64		
6		.62		
8			.85	
9	.61		.63	
7				.70
1				.68

It was apparent that there was a good deal of overlapping of variables across factors in both the "David" and "Class" data. The oblique solutions, rotating to the biquartimin criterion, resulted in considerable simplification of structure.

Table 7
Oblique Factor Solution
"David" Baseline

Var.	Factor			
	1	2	3	4
6	.87			
9	.84			
7	.63		.55	
3		.70	.33	
10		.63		
5		.59	-.32	.34
8			.59	
4			.45	.36
1				.71
2		.39		.45

Table 8
Oblique Factor Solution
"Class" Baseline

Var.	Factor			
	1	2	3	4
2	.85			
5	.76	.34		
9	.66		.59	
4	.47			-.37
3		.73		
10		.63		
6		.62	-.31	
8			.05	
7				.71
1				.68

The "David" baseline data were complex, the factors of which were interrelated in the "chain circumplex" (Cattell, 1966b) form. It was interesting to note that

the variable which was chosen for consequation, variable five, occupied a central place, being distributed among three of the four factors. This included its negative relationship with factor four. The "Class" baseline data also showed a circumplical pattern similar to that of the "David" data. Since primary and reference factor intercorrelations seemed to be quite low, second-order factor solutions were not sought for the "David" and "Class" data.

During the consequation phase of the study, responding on variable five, the "grasping" variable, was consequated according to procedures previously outlined. That the acceleration actually occurred may be seen from the following table.

Table 9
Target Child Responding on "Grasp" Variable
Successive Observation Days

Day	Phase					
	Baseline		Consequation		Return to Baseline	
	Rate	%	Rate	%	Rate	%
1	.03	9	.74	86	.09	56
2	.01	5	.33	62	.1	21
3	.01	4	.11	40	.02	9
4	.01	6	.21	95	.07	17
5	0	0	.41	67	.10	14
6	.01	7	.35	40	.1	47
7	.03	10	.5	7	.02	3
8	0	0	.15	19	.05	15

Table 9 continued

Days	Phase					
	Baseline		Consequation		Return to baseline	
	Mean	%	Mean	%	Mean	%
9	.07	12	.75	87	.10	15
10	0	0	.27	67	0	0
11	.02	9	.27	64	.02	14
12	.06	6	1.50	93	.06	10
13	.03	10	.50	92	.11	16
14	0	0	.75	93	0	0
15	.02	4	.30	75	.02	15
16	.02	10	.37	74	.26	29
17	.01	1	1.10	78	.03	18
18	.09	20	.24	57	.03	10
19	.01	3	.10	27	0	0
20	.10	20	.25	50	.03	11
21			.02	7+	.15	17

During the consequation phase, the target child consistently utilized the "grasping" response for more than 25% of the total responses he emitted. During the baseline phase, the child never went over 25%, while during the return to baseline he went over 25% only on three occasions, one of which was the first day of the extinction procedure.

A marked change occurred in the factor structure, both orthogonal and oblique, in the "David" data during consequation. As tables 10 and 11 illustrate, the overlapping of variables across factors became much less complex in both orthogonal and oblique solutions. The resulting structure, particularly in the oblique solution,

changed from a complex circumplical, wheel-like, network to a simple chaining of factors. Factors four and three were chained through variable three, factors three and one were chained through variable nine, and factors one and two were chained through variable seven. It was slightly more complex in the orthogonal solution, but the basic interrelationship of factors remained the same.

Table 10
Orthogonal Factor Solution
"David" Consequation

Var.	Factor				
	1	2	3	4	5
9	.61	.31			
2	.56				
3	.47			.30	
1		.96			
7		.77	.59		
10		.62	.30		
8			.97		
6				.62	
4					.54
5					.47

Table 11
Oblique Factor Solution
"David" Consequation

Var.	Factor			
	1	2	3	4
1	.98			
7	.74	.48		
10	.66			
5	-.33			
8		.99		
9	.37		.60	
2			.59	
3			.46	.32
6				.52
4				-.46

A less dramatic structural change was observed in the "Class" consequation data. As the following tables illustrate, the orthogonal solution was simpler as compared to the baseline solution, changing from a wheel-like complex to a simple chain. The oblique solution was also a simple chain.

Table 12
Orthogonal Factor Solution
"Class" Consequation

Var.	Factor			
	1	2	3	4
10	.67			
1	.55		.36	
3	.46			
6		.84		
9		.81		
2		-.33		
5			.71	
4			.66	
8				.76
7	.42			.75

Table 13
Oblique Factor Solution
"Class" Consequation

Var.	Factor			
	1	2	3	4
10	.65			
1	.54			.34
3	.47			
6		.84		
9		.83		-.31
2		-.32		
8			.77	
7	.44		.72	
5				.71
4				.67

During the return-to-baseline phase the orthogonal solution of the "David" data returned to something of the complexity it originally had. The oblique solution became

even simpler than during consequation, the single chain of factors becoming split into two 2-factor chains. Factors one and four were chained through variable three while factors two and three were chained through variable five.

Table 14
Orthogonal Factor Solution
"David" Return to Baseline

Var.	Factor			
	1	2	3	4
8	.79			
7	.78			
2		.86		
6		.78		
3	.31	.41	.32	.36
10			.70	
4			.69	
5	.40		.62	
9			.49	
1				.81

Table 15
Oblique Factor Solution
"David" Return to Baseline

Var.	Factor			
	1	2	3	4
2	.92			
6	.79			
3	.41			.34
4		.72		
10		.69		
5		.5[illegible]	.35	
9		.49		
[illegible]			.79	
7			.78	
1				.81

The orthogonal factor structure of the "Class" data followed the same pattern as the "David" orthogonal factor structure. During the return to baseline the "Class" factor structure returned to the complexity observed during the baseline period. The central feature of this complexity was the distribution of variable three over factors one, three and four. This included the negative relationship variable three had with factor four. On the other hand, the oblique solution represented a return to a chain-circumplex model, modified from Phase I .

Table 16
Orthogonal Factor Solution
"Class" Return to Baseline

Var.	Factor			
	1	2	3	4
4	.69			
2	.81			.33
3	.65		.45	-.32
9	.56			
1		.81		
7		.57		
10			.77	
5		.34	.59	
6				.71
8				-.50

Table 17
Oblique Factor Solution
"Class" Return to Baseline

Var.	Factor			
	1	2	3	4
4	.91			
2	.81			
3	.63		.32	.35
9	.57			
1		.81		
7		.58		
10			.79	
5		.35	.49	
6			.36	-.70
8				.48

The patterns of factor interrelatedness or factor structure for the "David" and "Class" data across all phases and for both types of solutions may be summarized in the following table.

Table 18
Summary of Factor Structure Patterns

Solution	Data Set			
	"David"		"Class"	
	Phase	Description	Phase	Description
Orthogonal	1.	Complexity to point of randomness	1.	Complexity, wheel-like
	2.	Five factors including four factor chain	2.	Four factors including three factor chain
	3.	Return to complexity, wheel-like pattern	3.	Return to wheel-like complexity
Oblique	1.	Complex pattern, chain-circumplex type with central hub	1.	Complex pattern, chain-circumplex, no central hub
	2.	Complete four factor chain	2.	Complete four factor chain
	3.	Two 2-factor chains	3.	Simplified circumplex

The orthogonal solutions plus the "Class" oblique solution started and ended in complex patterns. The consequation phase marked a simplification of factor interrelatedness. The "David" oblique solution, on the other hand, moved progressively from the complex to the simple across the phases of the study.

Factor Composition by Variables

The plan of development of the following interpretation involved the comparison of the factor compositions across the three phases of both the "David" and "Class" data types. In the following comparisons interest was focussed upon those variable groupings which persisted across at least two of the three phases. The factors themselves provided the basic groupings of the variables in each phase. These basic groupings were then compared for any combination of variables within each grouping which persisted across phase changes.

Table 19
Salient Within-Factor Variable Groupings
"David" Data

Phase		
Baseline	Consequation	Return to Baseline
2, 3	2, 3	2, 3
7, 8	7, 8	7, 8
10, 5	10, 5	10, 5
7, 9	7, 9	
3, 4	3, 4	
1,-5	1,-5	
	3, 6	3, 6
	-5,9,10	5,9,10
	-5, 7	5, 7
4, 5		4, 5
5,7, 8		5,7, 8

As Table 19 shows, three groupings were salient across all phase changes. The target child had three main types of responses which endured despite manipulations. The first response class, involving the "hit" and "push" variables, was tentatively labeled "physical roughness." The second grouping involved "hand holding" and "hug" variables. This group was labeled as "friendly clasping ." The third grouping involved the "grasp" and "touch" variables. This group was labeled "gentle touch" behavior. It was interesting to note that during the consequation of variable five, the "grasp" variable, it became negatively associated with variable ten, the "touch" variable. This quite correctly conformed to the general finding reported in Table 9 that during Phase II "grasping" behavior almost entirely dominated the target child's repertoire. This condition was reflected again in the grouping of variable five with variables seven and eight, "hand hold" and "hug" respectively during the baseline period and return-to-baseline period, dropping out during the consequation. In fact, variable five assumed a negative relationship with variable seven during consequation.

"Grabbing" and "grasping," variables four and five, became associated during baseline, to reappear again during the return to baseline. These two variables were related

in that they both involved the taking hold of another person with one hand. However, their association may also have been a recording artifact since rigorous separation of the two behaviors was a difficult matter during the data collection itself.

Finally it was interesting to note a new association of "pushing" and "patting," variables three and six, beginning during consequation and persisting into the return to baseline. This response class was labeled "flat-handed striking ." It appeared that this style of behaving was added more or less permanently to the target child's repertoire during the consequation phase.

In summary, three response classes were salient in the target child's repertoire, one of which lost a variable during the consequation but regained it in the return to baseline. A fourth response class was added to the child's repertoire during the period of manipulation.

Table 20
Salient Within-Factor Variable Groupings
"Class" Data

Phase		
Baseline	Consequation	Return to Baseline
1, 7	1, 7	1, 7
3,10	3,10	3,10
2, 9	2, 9	2, 9
-6, 9	6, 9	
1,-4	1, 4	
4,5, 9	4,5,-9	
2,4, 9		2,4, 9
3,5,6,10		3,5,6,10
-6, 8		-6, 8

Table 20 continued

Phase		
Baseline	Consequation	Return to Baseline
	1, 5 4, -9	1, 5 4, 9

The "Class" data represented the behavior which the target child received from his peers. Again three response classes persisted across all phases despite manipulation. The first response class, variables one and seven, or "brush off" and "hand hold" respectively. was labeled "hand to hand" behavior, since the response parameter of one child's hand touching the hand of another seemed to be the only unifying element in the group. The second grouping of variables three and ten, "push" and "touch," respectively, was labeled "flat handed touching" behavior, since a flattened palm was employed in each response. The third grouping of variables two and nine, "hit" and "arm around body," respectively, was labeled "aggressive contact" since a certain amount of force was employed in performing either behavior.

Finally the appearance of a new response class during the consequation was noted. This grouping included variables one and five, "brush off" and "grasp" respectively. Why these two were associated is somewhat puzzling. On

the one hand the relationship may have been through the response parameter of grasping which occurred in both behaviors. However, its first appearance during consequation led to an alternative hypothesis. During consequation the target child was doing a great deal of grasping. This behavior was usually performed upon the shoulder of another child. Thus the pattern of shrugging off the target child's "grasp" may have been begun, followed by an increase in peer "grasping" of the target child. This increase in peer "grasping" may have been a result of observing the target child's reward for such behavior (Bandura, 1966).

In summary, three salient response classes were present in the peer responses to the target child's behavior. A fourth response class appeared during consequation. It is hypothesized that this response class was a direct result of the effects of the target child's consequated behavior upon his classmates.

Cross-correlation Study

The study thus far concerned itself with the discovery of stable relationships within the target child's response system and within the response system of the class to the target child. The experimenter further desired to discover what relationships, if any, obtained between the response system of the target child and that of the class

towards him. Were there any behaviors performed by the target child which were highly correlated with behaviors received by the target child from his classmates?

To answer this question, the daily response rates of the ten variables in the "David" data were correlated across days with the same ten variables in the "Class" data. This was done for each of the three phases of the study. Table 21 below summarizes the results. For ease of reading, only correlations significant (Guilford, 1965) beyond the .05 level of probability are reported.

Table 21
Cross-correlation of "David" and "Class" Data

David	Baseline Class									
	1	2	3	4	5	6	7	8	9	10
1				.54	.50					
2			-.46							
3										
4		.70*								
5										
6	.74*									
7	.72*						.93*			
8										
9	.74*									
10										.48

	Consequation									
1							.75*			.56*
2										
3										
4										
5										
6					.46					
7							1.00*	.55*		.66*
8							.67*	.90*		
9			.45							
10							.62*			.51

Table 21, cont.

Return to Baseline										
David	Class									
	1	2	3	4	5	6	7	8	9	10
1		.59*		.56*		.65*				
2										
3		.55*	.47	.43					.60*	
4				.47	.80*					
5	.76*						.48			
6										
7	.58*						.99*			
8							.72*			
9	.51				.47					
10	.44				.49		.45			.49

* $p < .01$

Inspection of Table 21 shows that certain correlations are salient over two or three phases. The stability of these relationships is summarized in Table 22.

Table 22
Correlation Stability

Phase					
Baseline		Consequation		Return to Baseline	
Class	David	Class	David	Class	David
7-- 7		7-- 7		7-- 7	
10--10		10--10		10--10	
1-- 7				1-- 7	
1-- 9				1-- 9	
4-- 1				4-- 1	
		7-- 8		7-- 8	
		7--10		7--10	

Examination of the frequency of significant correlations per phase of the study revealed that the frequency

increased over phases. Of a total of 40 significant correlations, about 22% occurred during baseline, 28% occurred during consequation and 50% occurred during the return to baseline. This growth in the number of significant correlations is strongly suggestive of the growth of the mutual accomodation of class members' responses to target child's responses, and vice versa (Thibaut and Kelly, 1959).

The lambda index of predictive association (Hays, 1963) was computed in order to determine more fully the association between the number of significant correlations per variable and the phase of the study. The lambda value equals .20. This means that given the number of significant correlations for any variable per phase, the error in predicting the phase in which these correlations occur is reduced by about 20%. This is not a high index, but is supportive of the view that target child and class behavior repertoires successively approximated each other across the phases of the study.

Further evidence that behavior repertoires tended to approximate each other across phases came from an examination of the entire correlation matrix. Out of a total of 100 correlation coefficients, 28 of them, or 28%, demonstrated an increase when the return to baseline co-

efficients were compared with their counterparts in the baseline. To be counted, a correlation coefficient had to increase in departure from zero by .23 or more. When two variables correlate by .23 approximately 5% of their respective variances are accounted for by their covariance. Thus an increase of 5% or more arbitrarily qualified a correlation to be counted in the above tabulation. Thus, 28% of the correlations increased in strength by more than 5% from the baseline to the return to baseline phases. This was not considered conclusive, but rather supportive evidence for the assertion that the behavior repertoires of the target child and his classmates tended to successively approximate each other throughout the duration of the study.

Discussion and Summary

In broadest outline, this study has been concerned with the discovery of a patterned set of relationships (Burgess and Bushell, 1967) or social system. Secondly, it has been concerned with what happens to the relationships when the social system is manipulated. In other words, the second interest has been in the demonstration of homeostasis (Burgess and Bushell, 1967) or the dynamics of a social system undergoing change.

There have been two facets of the social system under study, i.e., the set of responses emitted by the target child David and the set of responses received by David from his classmates. The above elements may be grouped so that four types of analyses may be made. The following two-by-two table illustrates the concept.

	Intra-set	Inter-set
System Statics		
System Dynamics		

"System statics" refers to the structure of the system at any point. "System dynamics" refers to the nature of the changes occurring in the system structure over time. "Intra-set" analyses are those carried out within either the "David" or "Class" data sets. "Inter-set" analyses are those carried out between the "David" and "Class"

data sets. In terms of the statistical procedures used, the prefixes "intra-" and "inter-" refer to factor analysis and cross-correlation respectively.

Tables 5 through 8 and 10 through 17 represent the internal formal structure of the target child's responses and the responses received by him from his classmates. It was clear that a meaningful, if complex, structure was found within each set of responses, "David" or "Class," for each phase. The consideration of the interrelatedness of factors within each phase was not dependent upon the specific nature of the variables which overlapped two or more factors. Table 18 summarizes both the system statics and dynamics for both "David" and "Class ." In cross comparing the orthogonal solutions phase by phase, there is great similarity in each phase between the structure of "David's" responses and those of the "Class ." This similarity also holds true for the oblique solution except in the return-to-baseline phase. This matching of system structure across phases suggests that both "David" and the "Class" were mutually responsive to the shifts in each others' behavior repertoires. This is to say that insofar as the factor structure of the two response sets reflects a certain "style" of responding, the form of that style was similar for both "David" and "Class ."

The nature of the systems' dynamics differs depending upon the factor solution employed. The complexity of the orthogonal solutions in both the "David" and "Class" data suggests that the response dimensions are not independent but are correlated to some degree. This is entirely within Cattell's (1966b) expectations that the natural dimensions of human behavior will be correlated to some extent. In the oblique factor solutions, both the "David" and "Class" response systems demonstrate homeostasis in the face of disruption of the ongoing system. The nature of the self-correcting mechanisms is different in each response set. The "Class" set demonstrates the type of homeostasis which reestablishes the conditions prevalent before the system disruption occurred. The "David" set demonstrates a type of homeostatic mechanism which does not return to a previous state, but stabilizes and continues the new system conditions provoked by the disturbance to the system. In brief, the "Class" system follows a sort of A-B-A pattern, while the "David" system follows an A-B-B pattern.

The consideration of the interrelatedness of factors ignored the question of whether or not certain variables in each set of responses clustered together stably. Tables 19 and 20 summarized the stability of variable clusters

across phases for "David" and "Class" respectively. In both data sets three types of homeostasis were observed. There were three clusters in both data sets which appeared in all three phases. These clusters of variables were insensitive to the disruption of the social system. These clusters of variables were the most stable of the response classes found. The second type of homeostasis followed the A-B-A pattern. Clusters present in the baseline phase were disrupted during the consequation but were reestablished during the return to baseline. The third type of homeostasis was of the A-B-B pattern. New clusters established during the strengthening of one behavior stabilized and became a feature of the return-to-baseline phase. This latter type of self-regulation reflects the third point in Sidowski's definition of a social system (1957), that responses controlling reward and/or punishment are subject to learning. This latter type of self-regulation also reflects Cattell's definition of learning: ". . . multidimensional change in response to experience in a multidimensional situation" (1966c, p.360).

Two facts concerning the data of Table 22 are important. It was clear that in significant correlations which extended over two phases, there were none which extended over the baseline and consequation, extinguishing

in the return to baseline. Secondly the return to baseline phase represents the sum of all stable and significant correlations originating in either of the previous two phases. This is perhaps the strongest evidence for the assertion that the behavior of the target child and that of his classmates accomodated to each other (Thibaut and Kelly, 1959). There were also a great many transient correlations. These transient correlations composed 44%, 64% and 65% of the total number of correlations in the three phases respectively. Given such a variety of correlations, it was indeed remarkable to discover stable relationships. Thus the great number of transient correlations argued for the strength of those correlations which remained salient.

Another interesting fact may be gleaned from the examination of Table 21. There were nine significant correlations in the baseline phase, eleven in the consequation phase and twenty in the return-to-baseline phase. The number of significant correlations in the last phase exactly equals the sum of the significant correlations in the previous two phases. Furthermore, there was a steady increase in the number of correlations significant beyond the .01 level of probability across the phases. In the first phase the number of such was five; eight were found in the second phase and ten in the third. Both

these facts further support the view that the behavior repertoires of the target child and those of his classmates successively approximated each other across phases in both number of relationships and strength. The effect of the consequation phase was to stimulate the approximation to each other of the target child and class behavior repertoires.

Table 21 shows the inter-set system statics. It is apparent that there were patterns of interaction within each phase of the study, as indicated by the tabled correlations. Of greater interest is what happened to these interaction patterns across phases. The increase in both number and strength of the significant correlations suggests that both "David" and his classmates were each shaping their behavior repertoires in response to the other (Burgess and Bushell, 1967; Patterson, 1966; Patterson and Anderson, 1964; Thibaut and Kelly, 1959; Watzlawick, Beavin and Jackson, 1967). The evidence of the great number of cross-correlations unique to each phase suggests a good deal of mutual shifting of behavior repertory (Thibaut and Kelly, 1959) to meet the new social demands of each new phase.

Of greatest interest are the correlations which persisted over two or three phases. These present direct

evidence of the workings of self-regulatory mechanisms in the behavioral interactions of "David" and his peers. These homeostatic mechanisms were of the same three types discussed above. "Touching," or variable number ten, was correlated with its counterpart in the other data set across all three phases. It was insensitive to system disruption and therefore may be considered as a stable characteristic of the social system which existed among David and his peers during the period of the study. The second and third types of self-regulatory systems followed the A-B-A and A-B-B patterns respectively.

In sum, there was evidence of structure both within and across the response sets of "David" and "Class ." Additionally there was evidence of three types of self-regulating mechanisms operating across the three phases of the study in both the "David" and "Class" response sets. These mechanisms included those which remained insensitive to radical system changes, those which followed the A-B-A pattern and those which followed the A-B-B pattern.

Recommendations for Future Research

An implicit assumption of the study has been that the system statics and system dynamics of David's social milieu would be similar to that of the social milieu of other kindergarten children, both those with whom David

interacted and kindergarten children generally. An alternate possibility is that systematic differences in system statics and dynamics might occur due to racial, sexual, social class or other differences. Replication of this study is desirable therefore to test both of these assumptions.

A longitudinal study of a single child's non-verbal social relationships would be desirable in order to determine the influence of developmental factors upon the structure and dynamics of the child's social relationships.

A persistent problem in the present study was the inefficiency of the data collection system. Occasionally behaviors occurred with such rapidity that scoring by hand was very difficult. To minimize the potential for inaccurate or missing rates a semi-automated system incorporating observer operated multi-channel event recorders might be useful.

Whole new areas of research may be investigated by certain modifications of the data collection format of the present study. The temporal patterning of each child's responses within each observation day might be ascertained by dividing up each observation period into smaller seg-

ments. Statistical tools for the analysis of such data have already been developed (Cattell, 1966c). Furthermore the patterns of sequential interactions between children may be easily plotted by recording the emitted behaviors along a time line, with the aid perhaps of event recorders. Typical interaction patterns may more easily and accurately be spotted using this technique rather than the more indirect method of cross-correlation used in the present study.

Finally, the whole matter of direct observation and recording of social behavior in the field setting lends itself to the exploration of personality itself. The objective analysis of a person's social functioning has hardly been exploited. Many judgements are made about personality types on the basis of behavior only remotely, if at all, related to social behavior, the behavior of interest. Objective methods of data collection, such as those employed in the present study, offer an opportunity to directly investigate the behaviors upon which personality judgements are made. Statistical tools have recently been developed (Cattell, Coulter and Tsujioka, 1966) with which to develop more adequate criteria for personality classifications.

The pioneer work of Hoon (1970) demonstrated the effectiveness of factor analysis in the investigation of social behavior by teaming it with the precise recording of objective behavior. The present study goes one step beyond Hoon by teaming an entire operant paradigm with factor analysis. The present study demonstrated the practicality of the operant approach for the investigation of group phenomena as well as showing the analytic power of factor analysis in the discovery and monitoring of the organization of social behavior.

Furthermore, factor analysis teamed with the precise recording of behavior is useful in the location of behaviors which occupy a central place in the hierarchy of an individual or group's behavior repertoire. Such a location of central behaviors may be of great importance in the selection of appropriate treatment variables for family or milieu therapy.

Work in the experimental analysis of social systems is in its infancy. It is believed that such objective analyses, as in the present study, may broaden immeasurably our understanding of Man, the social animal.

Appendices

Appendix A
Category Definitions

1. Brush Off: one person removes the hand or arm of the other person by using his own hand or arm in a brushing or pushing motion.
2. Hit: one person strokes another with his open or closed hand.
3. Push: one person places his open hand or hands upon the body of another physically displacing the other's body.
4. Grab: one person wraps one of his hands around a portion of another person's body and attempts to stop the other from moving or attempts to displace physically the other person's body or portion thereof.
5. Grasp: one person wraps one of his hands around a portion of another person's body but in no way attempts to initiate or terminate movement in the other's body.
6. Pat: one person touches the body of another with one hand two or more times in rapid succession. Included here is rubbing or stroking of another.
7. Hand Hold: one person "grasps" or "grabs" another's hand. In this case alone is the "grasp" or "grab" rescored as "hand hold".
8. Hug: one person wraps both arms around the body of another but does not attempt to bring the other to the floor.

9. Arm Around Body: one person wraps one arm around the shoulders or trunk or hips of another.
10. Touch: one person places the flat of his hand, either front or back of hand, upon the body of another and does not attempt to initiate or terminate any bodily movement of the other.

Appendix B
Selection of Consequated Variable

Table 23
Factor Solution of David's Baseline
First Approximation

Var.	Factors					
	1	2	3	4	5	6
1	0.1626	-0.1681	0.3264	0.0694	0.1435	0.5050
2	0.0182	-0.0329	0.8625	0.1326	0.0047	o.0480
3	0.0386	0.2789	-0.0156	0.0145	0.8047	0.3579
4	0.7201	0.1543	-0.0535	0.2079	0.0181	0.0848
5	-0.2732	-0.3737	-0.4798	0.4730	0.1598	0.3200
6	0.2308	0.1285	0.1939	0.8711	0.1752	0.0666
7[a]	0.1143	0.8748	0.1144	0.1034	-0.0742	0.0901
8	-0.6640	0.3588	-0.0448	0.1872	-0.0414	-0.0928
9	0.1991	-0.2302	-0.0026	0.2029	0.8246	-0.0235
10	0.6081	-0.0320	0.2004	0.1622	0.3241	-0.0026
11	0.0536	0.5148	-0.2400	0.0838	0.1421	0.7100
12	-0.1873	0.7249	-0.1004	-0.0364	0.0471	-0.0156
SS	1.58	2.03	1.24	1.17	1.54	1.02

[a] This variable was renumbered "5" in subsequent data analyses.

Examination of the resulting orthogonal factor matrix, Table 23 above, showed that variable number seven was a good behavior to consequate. This was for three reasons:

1. It was a member of a factor which had the highest sum of squared loadings in the matrix.
2. The factor had three variables highly correlated with it, variables seven, eleven, twelve and variable eight to a lesser extent.
3. Variable seven was the item having the highest loading on the chosen factor, a loading of about .87.

Thus it was the most representative of that factor. It was assumed therefore that the whole response class represented by this factor could be consequated by the consequation of variable seven.

Appendix C
Building the Response Chain

1. Magazine training on a free-feeding schedule was instituted. David fed himself either M & M's or raisins from the bowl which was later to become the token bowl. The purpose of this pairing was to condition the physiological changes preceeding eating to the stimulus of the bowl filled with objects. The objects in this case happened to be the primary reinforcers themselves. The rate of feeding on both candy and raisins was recorded in order to gain some preliminary information on response strength. Over extended periods of observation David maintained a rate of 4.3 responses per minute and 2.4 responses per minute for candy and raisins respectively. Not only was response strength high for the candy, it was also practically twice that for raisins. Data comparing rates of eating candy and raisins was kept for two more days. The results are summarized below:

Table 24
Eating Rate Comparisons

Stage	Day	Reward	
		Candy	Raisins
1	1	4.30	2.40
2	2	2.30	1.20
3	3	1.70	0.20[a]
4	4	1.60	
	5	1.10	
	6	0.46	
5	7	1.91	

[a] Subject requests return of candy

It was clear from the data that David could eat candy at a reasonably high rate and that he preferred it to raisins. For the remainder of the training period, M & M's were the primary reinforcers of choice.

2. In stage two, another neutral stimulus, a buzzer, was paired with eating. The purpose was to condition the physiological "anticipation" of eating to the buzzer.

3. Stage three required that the candy be eaten one item at a time at the bowl.

4. In stage four when David was approaching the bowl regularly, a muted bell was sounded immediately followed by the placing of candy in the bowl. The buzzer continued to be paired with the eating response as in previous stages. The bell was established later as a discriminative stimulus for candy delivery. It also was positioned in David's response chain so as to function as a reward for approaching the bowl.

5. The basic procedure for stage five was the same as for stage four, except that a token was placed in the bowl rather than the candy. The buzzer-eating pairing was terminated. Additionally, a form of reinforcement menu (Homme, deBaca, Cottingham and Homme, 1968) was employed. With the exchange ratio set at 1:1, David was allowed to exchange his token for M & M's, raisins, salted peanuts or Fruit Loops. As the last

entry of Table 24 shows, the rate of eating more than quadrupled over the previous day's rate, using this procedure.

6. In stage six the procedure of stage five was continued with one change. Every minute the bell was sounded, followed immediately by the delivery of a token to the bowl. This procedure was followed for two days. During this period, exchange latency frequencies and the average probability of exchange per opportunity were recorded. To record the former, each sounding of the bell started a timer. When David exchanged the token, the timer stopped and the time was recorded to the nearest five seconds. If David did not come to the bowl and exchange his token within one minute, the timer was reset to zero, latency was recorded as one minute and the sequence of bell and token delivery began again.

Table 25
Token Exchange Latencies

Days	Seconds											
	5	10	15	20	25	30	35	40	45	50	55	60
1	5	3	5	0	0	0	3	0	0	1	0	39
2	13	5	2	1	1	0	3	1	2	0	2	45
Totals	18	8	7	1	1	0	6	1	2	1	2	84

To compute the average probability of token exchange per opportunity, each bell-token delivery sequence was counted as one opportunity. The probability itself was the ratio of opportunities taken divided

by the total opportunities provided. The table of exchange probabilities is included below.

Table 26
Average Probability of Token Exchange

Training Stage	6		7	8	
Day	1	2	3	4	5
p	.30	.42	.74	.89	.92[a]

[a] Adjusted value

The behavior sample of day five in Table 26 excludes an extended period of painting activity during which time all other behavior extinguished. Without adjustment the p-value is 0.66.

It may be observed from Table 26 that by the end of training, there was a high probability that David would come to the bowl to receive tokens and exchange them for one of several primary reinforcements.

7. Examination of the data from stage six indicated that if David were allowed to come to the bowl whenever he pleased the probability of coming was low. The frequency distribution of latencies, Table 25, shows that David's general pattern was to allow tokens to accumulate such that he came to the bowl about one chance in three. It was essential for the success of the consequation method that the bell be maintained at high strength as a discriminative stimulus so that it

could later function as a conditioned reinforcer as well. It was believed that one reason for the low exchange probability was a lack of attentiveness to the bell sound. Therefore, in stage seven the procedure of stage six was continued, but David was not allowed to come to the bowl to receive and exchange tokens until he heard a buzzer. On the average, the observer allowed three to four tokens to accumulate before sounding the buzzer. An additional feature of this stage was that David was allowed only ten seconds in which to come to the bowl to receive his tokens after the sounding of the buzzer. After the passage of ten seconds, the tokens were removed from the bowl and were no longer available for exchange. The increase in exchange probability, Table 26, may be seen as a consequence of this procedure.

8. In stage eight, a temporal discrimination was added to the procedure of stage seven. Since the response probabilities for stage six indicated that David preferred to let roughly three tokens accumulate before exchanging them for a primary reinforcement, it was decided to consistently "call" David to the bowl, via the buzzer stimulus, after every third token was delivered. The two minute temporal interval was marked at every minute by the usual bell-token delivery sequence. When a buzzer call was missed,

the succeeding temporal interval was shortened to one and one-half minutes, marked by the bell-token delivery sequence every thirty seconds. Presumably the dramatic speeding up of the temporal interval consequent upon a missed buzzer call refocussed David's attention upon the sound of the bell. No experimentation was done to prove this assumption however. In any event, the result of the entire procedure was to further increase the exchange probability from .74 to .89. The second day of this procedure saw an increase to .92 probability. At this point the data indicated that David was responding to the whole chain of events quite reliably. A discriminative stimulus, a muted bell sound, began the whole chain. To consequate the chosen behavior the bell sound had to be transformed to a conditioned reinforcer.

To summarize the training up to this point: every minute a bell would sound, immediately followed by the delivery of a token into a bowl. Consequent upon the third delivery of a token a buzzer was sounded, after which David had ten seconds in which to retrieve his tokens and exchange them for one of a variety of edible primary reinforcements.

9. In stage nine it was announced to David that he could "make the bell work" for himself by grasping

others. The consequation phase began with reinforced practice in grasping by David. Some minor refinements were added to the procedure as follows:

(a) The ratio of token deliveries to buzzer "calls" was adjusted to 5:1.

(b) An introduction of a brief time out after every token delivery so as to facilitate accurate recording of behavior.

The consequation data included in the data analysis comprise only the data gathered after the token to buzzer ratio was stabilized at 5:1.

Appendix D
Daily Rates of "David" and "Class"

Observation Days	David Baseline Variables									
	1	2	3	4	5	6	7	8	9	10
1	.03	.04	.04	.06	.03	0	.04	.01	.04	.10
3	0	.03	0	.02	.01	.01	.01	0	0	.11
6	0	.01	.04	0	.01	.02	.07	0	0	.10
8	0	.02	.01	0	.01	.01	0	0	.01	.10
13	.01	0	.07	.02	0	.03	.07	0	.04	.06
15	.01	0	0	0	.01	.06	0	0	0	.07
19	.02	.01	.03	0	.03	.01	.05	0	.01	.16
20	0	.02	.03	0	0	.03	.02	0	0	.07
22	.01	.09	.08	.02	.07	.04	.03	0	.05	.22
24	.02	.05	.05	0	0	.01	.02	0	.03	.06
27	.01	.02	.04	.01	.02	.03	.02	0.	.01.	.09
29	.01	0	.04	.01	.06	.21	.12	0	.18	.17
41	0	0	.05	0	.03	.01	.01	0	.04	.17
43	.02	.02	.01	0	0	0	.06	0	0	.03
45	.01	.03	.04	.03	.02	.01	.05	.03	.01	.04
48	0	0	.02	0	.02	.04	.01	0	.02	.09
50	.02	.04	.07	.01	.01	.05	.06	.03	0	.11
52	0	.03	.11	.01	.09	.04	.01	0	.04	.12
55	.01	0	.06	0	.01	0	.04	.02	.04	.14
57	.04	.04	.02	0	.10	.08	0	0	.08	.12

David Consequation

1	0	.022	0	.022	.840	0	0	0	0	.088
2	0	.016	.050	0	.330	.050	0	0	0	.083
3	0	0	.066	0	.110	0	0	0	0	.088
8	0	0	.018	0	.810	0	0	0	0	.018
9	0	.016	.083	0	.410	.016	0	0	.033	.050
10	0	.050	.100	0	.350	.016	.033	.050	.066	.216
11	.013	0	.013	.013	.580	.026	.013	0	0	.080
12	.054	0	0	0	.150	0	.180	.018	.036	.250
16	0	.016	0	0	.750	0	0	0	0	.100
17	0	.054	.018	0	.270	0	0	0	0	.054
18	0	0	0	0	.270	0	0	0	.018	.126
22	0	0	0	0	1.500	.028	0	0	0	.057
24	0	0	0	.020	.500	0	0	0	0	.020
25	0	.050	.025	0	.750	0	0	0	0	.075
29	0	.040	.020	0	.300	0	0	0	0	.040
30	0	0	.022	0	.370	0	0	0	0	.022
31	0	.030	.092	.015	1.100	0	.015	0	0	.140
32	0	.066	.044	0	.240	0	0	0	0	.066
36	0	0	.023	.011	.180	0	.140	.140	.011	.140
37	0	0	0	0	.250	0	0	0	.050	.200
38	0	.088	.022	.022	.620	0	0	0	.066	.022

Observation Days	David Return to Baseline Variables									
	1	2	3	4	5	6	7	8	9	10
1	.020	0	0	0	.090	0	0	0	.020	.036
3	0	.033	.100	.016	.180	.033	0	0	.033	.410
4	0	0	.016	.016	.016	.016	0	0	.050	.050
9	.020	.066	.020	0	.066	.020	0	0	.044	.140
10	.020	0	.040	.040	.100	0	0	0	.060	.420
11	0	0	0	.020	.180	0	0	.020	.060	.100
15	0	0	.016	.033	.016	.016	.080	.016	.050	.210
16	0	0	0	.016	.050	.016	0	0	.066	.160
17	.033	.050	.083	0	.180	0	.316	.066	.033	.350
18	0	.022	.022	0	0	0	0	0	0	.022
22	0	0	0	0	.016	0	0	0	.033	.066
23	0	.020	.060	0	.060	0	0	.020	.060	.100
24	.050	.050	.100	.033	.110	0	0	.016	.066	.083
30	0	0	0	0	0	0	0	0	0	0
31	0	.083	.066	.016	.083	.083	.033	0	.050	.133
32	0	.060	.040	.020	.260	.020	.180	0	.100	.220
36	0	0	.033	0	.033	0	.016	0	0	.100
37	0	0	.066	0	.033	0	.066	0	.033	.133
38	0	.016	.033	0	0	0	.016	0	.083	.116
39	.033	.016	.033	.033	.033	0	.066	.016	.016	.050
43	.016	0	.050	.083	.150	0	.100	0	.050	.300

Class Baseline

1	.01	.06	.02	.04	.07	.02	.04	0	.04	.06
3	.02	.01	0	.02	0	0	.01	0	0	.02
6	.03	.01	.02	0	.03	.06	.05	0	.01	.05
8	0	0	.01	0	.02	0	0	0	0	.13
13	.03	.02	.02	0	.01	.01	.07	0	0	.06
15	0	0	.01	.02	0	0	0	0	0	.09
19	0	0	.06	0	0	.03	.05	0	0	.14
20	.01	0	.02	0	.02	.01	.02	0	.02	.04
22	0	.02	0	.01	0	0	.04	0	.01	.10
24	.01	.03	0	.07	.01	0	.03	0	0	.01
27	.02	.04	.05	0	.04	.01	.02	0	.02	.06
29	.11	.03	.02	0	0	0	.08	0	.02	.06
41	.01	.02	.04	.01	0	0	0	.03	.05	.10
43	.01	0	.02	0	0	0	.07	0	.01	.01
45	.02	.02	.01	0	0	.01	.05	0	.01	.07
48	.02	0	.03	0	0	.04	.01	0	0	.09
50	.01	.01	.02	0	.03	.04	.07	0	0	.07
52	.02	.01	.01	0	.03	.02	.01	0	.01	.06
55	.03	0	.05	.01	.01	.01	.04	0	0	.19
57	0	.02	.04	.04	.06	.08	0	0	.04	.16

Observation Days	Class Consequation Variables									
	1	2	3	4	5	6	7	8	9	10
1	.022	0	.022	.044	.022	0	0	0	0	.022
2	.033	.033	.016	0	.100	0	0	0	0	.050
3	0	.044	0	0	0	0	0	0	0	.022
8	0	.018	.018	0	0	0	0	0	0	.036
9	.033	0	0	.050	.110	.016	0	.016	0	.033
10	.033	0	.100	0	.015	0	.033	0	.016	.133
11	.026	.026	0	0	.037	0	.013	0	0	.066
12	.036	0	.018	0	.090	0	.180	0	0	.198
16	.016	0	0	0	.033	0	0	0	0	.033
17	.036	0	.036	0	.018	0	0	0	0	.108
18	0	0	0	0	0	0	0	0	0	.018
22	.028	0	0	0	0	0	0	0	.028	.042
24	0	0	0	0	0	0	0	0	.020	.060
25	.025	0	0	0	.020	.050	0	0	.050	.100
29	0	.020	.020	0	0	0	0	0	0	.060
30	.066	0	.022	0	0	0	0	0	0	.088
31	.077	.015	0	0	.046	.015	.015	0	0	.140
32	.022	0	.022	.022	.044	0	0	0	0	.133
36	.011	0	.023	0	.011	.011	.140	.070	0	.117
37	.025	.025	0	0	0	0	0	0	0	.050
38	.022	0	.022	0	.020	0	0	0	0	.044

Class Return to Baseline

1	.036	0	.020	0	.020	.020	0	0	0	.020
3	.016	.033	.066	.016	.033	.016	0	0	.083	.170
4	0	.016	0	0	.050	0	0	0	.050	.050
9	0	0	0	.020	.020	0	0	0	.020	.066
10	.040	0	0	0	.120	.040	.020	0	.040	.200
11	.040	0	.040	0	.060	0	0	0	0	.080
15	.033	.033	.050	.033	.016	0	.080	.016	.033	.066
16	0	0	.066	0	.050	0	0	.016	.016	.016
17	.050	.066	.016	0	.016	.016	.333	0	.016	.100
18	0	0	.022	0	0	0	0	0	0	.022
22	.033	0	.016	0	.016	0	0	0	0	.066
23	0	.020	.120	0	.060	0	0	.020	0	.240
24	.016	.333	.133	.083	.066	.033	0	0	.083	.133
30	0	0	.020	0	0	0	0	0	0	.020
31	.033	.016	.016	0	.016	.016	.033	0	.016	.066
32	.120	.120	.020	0	.060	.020	.160	0	0	.160
36	0	0	.016	0	.016	.016	.016	0	0	.200
37	0	0	.066	0	.033	0	.066	0	.100	0
38	.016	0	.016	0	.033	0	.016	.016	.050	.050
39	0	0	.033	0	.016	.033	.083	0	0	.100
43	.066	.033	.116	.033	.180	0	.100	0	.033	.130

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Biographical Sketch

Jerome R. Freund was born May 6, 1940 in India of missionary parents. He received his B. A. in philosophy from Westminster College in Fulton, Missouri, in June of 1962. He studied for a year thereafter in St. Andrews University, Scotland, on a Fulbright Scholarship. Mr. Freund completed his B. D. at Union Theological Seminary, New York, on June, 1968. Between his middler and senior year, Mr. Freund served as a Methodist missionary to the Congo and Malawi for three years. Mr. Freund was ordained into the Protestant ministry in February of 1969. In December, 1970, he received his M. S. in psychology from the University of Florida. He received his Ph. D. in clinical psychology in June, 1972, from the University of Florida.

Mr. Freund is married to the former Elizabeth Lee Patterson of Norfolk, Virginia. The couple have two children, Robert Lee and Natashya Lee.

Mr. Freund is currently employed as an intern in clinical psychology at the Guidance Center, Inc., Daytona Beach, Florida.

I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.

William D. Wolking, Chairman
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Professor of Foundations of
Education

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Henry S. Pennypacker, Jr.
Professor of Psychology

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Richard K. McGee
Associate Professor of
Clinical Psychology

I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.

Madelaine Ramey
Assistant Professor of Psychology

This dissertation was submitted to the Department of Psychology in the College of Arts and Sciences and to the Graduate Council, and was accepted as partial fulfillment of the requirements for the degree of Doctor of Philosophy.

Dean, Graduate School

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